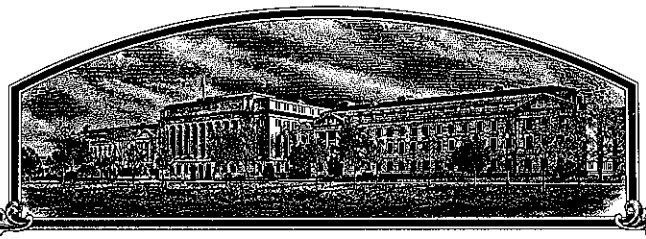

No. 9200214

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Wisconsin Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF *eighteen* YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT ETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS Y THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT

'Glacier'

In Testimony Whereof, *I have hereunto set my hand and caused the seal of the* Plant Variety Protection Office *to be affixed at the City of* Washington, D.C. *this* 29th *day of* January *in the year of our Lord one thousand nine hundred and* ninety-three.

Attest:

Kenneth W Evans

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

FORM APPROVED: OMB 0581-0055, Expires 1/31/91

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions on reverse)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) *(as it is to appear on the Certificate)*
Wisconsin Agricultural Experiment Station
R.A. Forsberg, Authorized

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NO.
X1625-1-1

3. VARIETY NAME
Glacier

4. ADDRESS *(street and no. or R.F.D. no., city, state, and ZIP)*
Agriculture Hall
University of Wisconsin-Madison
Madison, WI 53706

5. PHONE *(Include area code)*
608-262-0246

FOR OFFICIAL USE ONLY

PVPO NUMBER
9200214

FILING
Date: June 18, 1992
Time: 3:50 ☐ A.M. ☑ P.M.

FEES RECEIVED
Filing and Examination Fee: $2150.—
Date: June 18, 1992
Certificate Fee: $250.00
Date: Jan. 12, 1993

6. GENUS AND SPECIES NAME
Triticum aestivum L. em Thell.

7. FAMILY NAME *(Botanical)*
Gramineae

8. CROP KIND NAME *(Common Name)*
Wheat (soft red winter)

9. DATE OF DETERMINATION
August 23, 1991

10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION *(Corporation, partnership, association, etc.)*
Wisconsin Agricultural Experiment Station

11. IF INCORPORATED, GIVE STATE OF INCORPORATION

12. DATE OF INCORPORATION

13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS
Dr. Robert A. Forsberg, Department of Agronomy
University of Wisconsin-Madison
1575 Linden Drive
Madison, WI 53706
PHONE *(Include area code)*: 608-262-0246

14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED *(Follow INSTRUCTIONS on reverse)*

a. ☒ Exhibit A, Origin and Breeding History of the Variety.
b. ☒ Exhibit B, Novelty Statement.
c. ☒ Exhibit C, Objective Description of Variety.
d. ☒ Exhibit D, Additional Description of Variety.
e. ☒ Exhibit E, Statement of the Basis of Applicant's Ownership.
f. ☒ Seed Sample (2,500 viable untreated seeds). Date Seed Sample mailed to Plant Variety Protection Office _____.
g. ☒ Filing and Examination Fee ($2,150) made payable to "Treasurer of the United States."

15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? *(See section 83(a) of the Plant Variety Protection Act.)*
☒ YES *(If "YES," answer items 16 and 17 below)* ☐ NO *(If "NO," skip to item 18 below)*

16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☒ YES ☐ NO

17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?
☒ FOUNDATION ☐ REGISTERED ☒ CERTIFIED

18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S.?
☐ YES *(If "YES," through* ☐ Plant Variety Protection Act ☐ Patent Act. Give date: _____.)
☒ NO

19. HAS THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETED IN THE U.S. OR OTHER COUNTRIES?
☒ YES (If "YES," give names of countries and dates) Released to growers of Certified Seed (USA) on September 1, 1991
☐ NO

20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in section 41, and is entitled to protection under the provisions of section 42 of the Plant Variety Protection Act.

Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT *(Owner(s))*	CAPACITY OR TITLE	DATE
Robert A. Forsberg *Robert A. Forsberg*	Professor/Agent	June 10, 1992
SIGNATURE OF APPLICANT *(Owner(s))*	CAPACITY OR TITLE	DATE

9200214

EXHIBIT A: ORIGIN AND BREEDING HISTORY OF THE VARIETY

GLACIER WHEAT (Wisconsin selection X1625-1-1, PI 555586)

The pedigree of Glacier is:

OH 112/Argee/2/Argee

= Logan/Benhur sib/2/Argee/3/Argee

Ohio selection OH 112 was an entry in the USDA Uniform Eastern Soft Red Winter Wheat Nursery (UESRWWN) in 1978, 1979, and 1980. The first cross with Argee was made in the winter wheat field nursery at Madison, WI, in 1978. The backcross to Argee was made in the 1979 Madison field nursery. Argee, CI. 17606, is a Wisconsin cultivar released in 1976. It was granted Plant Variety Protection Certificate No. 780016 on 20 September, 1978.

Breeding History:

Glacier was developed by workers in the Department of Agronomy, University of Wisconsin-Madison, Madison, WI. The pedigree method of plant breeding was strictly followed, and the chronology of crosses and progeny generations is listed below:

Initial cross (OH 112/Argee) made	1978 field nursery
Backcross (F_1(X1569)/Argee) made	1979 field nursery
Backcross F_1(X1625) plants	1980 field nursery entry 4110
X1625 BC F_2 population (10-ft. row)	1981 field nursery entry 3302
X1625 BC F_3 line (5-ft. row)	1982 field nursery line X1625-3580
X1625 BC F_4 line (5-ft. row)	1983 field nursery line X1625-2364
X1625 BC F_5 line (5-ft. row)	1984 field nursery line X1625-5583
X1625-1 BC F_6 line (5-ft. row)	1985 field nursery line 1625-1-1876
X1625-1 BC F_7 line (5-ft. row)	1986 field nursery line 1625-1-1107

The plants in line (row) X1625-1-1107 (1986) were cut and threshed in bulk. This population was henceforth tested as X1625-1-1 and it subsequently became Glacier.

X1625-1-1	1987 preliminary yield trial (Single Series) at Madison, WI.
X1625-1-1	1988 Main Madison performance trial
X1625-1-1	1989 onward. Continuously entered in the Arlington, WI, drill plot trial, the main Madison trial, trials at the Wisconsin statewide Agricultural Research Stations (ARS), and in four county trials.
X1625-1-1	1989, 1990, and 1991. Evaluated in the USDA Uniform Eastern Soft Red Winter Wheat Performance Nursery, a multi-state performance test.

The primary selection criteria in the BCF_2 population and in the BCF_3 through BCF_7 lines were winter hardiness; productive agronomic appearance; resistance to leaf rust, stem rust, mildew, and the barley yellow dwarf virus; straw stiffness; and good soft-wheat grain quality as indicated by endosperm softness.

Monitored closely in all performance trials were grain yield, test weight, winter hardiness, straw strength, response to diseases, and milling and baking quality. Starting with the 1987 crop, seed of X1625-1-1 has been submitted annually to the USDA Soft Wheat Quality Laboratory, Wooster, OH, for milling and baking tests.

Breeders seed of X1625-1-1 was increased in 1990, Foundation Seed was produced in 1991, and Foundation Seed was released to growers of Certified Seed in September 1991. Certified Seed of Glacier will be available for planting by farmers in fall, 1992.

The Breeders seed increase field (1990) and the Foundation Seed production field (1991) were inspected by the breeder (R. A. Forsberg) and by foundation program field inspectors. Variants which are 4 to 6 inches taller in plant height constitute 1% of Glacier and are considered a part of the Glacier population. Glacier is stable for all other phenotypic and genotypic characteristics consistent with normal environmental influences. Glacier is a self-pollinated wheat cultivar.

9200214

EXHIBIT B. NOVELTY STATEMENT

The variety of wheat most similar to Glacier is Argee. (Argee is the backcross or recurrent parent of Glacier and therefore Argee appears twice in the pedigree of Glacier.) Glacier differs uniquely and specifically from Argee as follows:

1. Glacier is highly resistant to bunt (Tillitia caries) while Argee is susceptible. See data summary in Exhibit D on document page:

	Glacier	Argee	Merrimac
No. of tests	9	20	19
Range of infection	0.0-2.0%	10.1-77.3%	1.6-9.3%
Unwted mean	0.7%	32.1%	4.1%

2. Heading date: Glacier heads 3 days earlier than Argee, 2.7 days earlier than Merrimac, and 3.1 days later than Caldwell.

3. Plant height: Glacier is 7 cm shorter than Argee and 6 cm shorter than Merrimac.

4. Snap-back: Glacier has stiffer straw than Argee or Merrimac. Thus, Glacier has a higher snap-back score and lower lodging than either Argee or Merrimac:

	Snap-back 0 = weak 10 = stiff	Lodging %
No. of tests	3	6
Glacier	7.8	5.8
Argee	7.0	21.4
Merrimac	7.2	23.6

5. Glume shoulder:

Glacier = oblique
Argee = elevated
Merrimac = oblique

6. Brush:

Glacier = short
Argee = medium
Merrimac = medium

7. Kernel weight

Cultivar	1,000 kernel wt.
Glacier	28g
Argee	39g
Merrimac	37g

Glacier has lower kernel weight than Argee or Merrimac.

FORM APPROVED: OMB NO. 0581-0066

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK AND SEED DIVISION
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(Wheat)

OBJECTIVE DESCRIPTION OF VARIETY
WHEAT (*TRITICUM SPP.*)

INSTRUCTIONS: *See Reverse.*

NAME OF APPLICANT(S): Wisconsin Agricultural Experiment Station (R.A. Forsberg, Agent)

ADDRESS (*Street and No. or R.F.D. No., City, State, and ZIP Code*)
Agriculture Hall, University of Wisconsin-Madison
Madison, WI 53706

FOR OFFICIAL USE ONLY

PVPO NUMBER: 9200214

VARIETY NAME OR TEMPORARY DESIGNATION: Glacier

Place the appropriate number that describes the varietal character of this variety in the boxes below.
Place a zero in first box (e.g. [0][8][9] or [0][9]) when number is either 99 or less or 9 or less.

1. KIND:
[1] 1 = COMMON 2 = DURUM 3 = EMMER 4 = SPELT 5 = POLISH 6 = POULARD 7 = CLUB

2. TYPE:
[2] 1 = SPRING 2 = WINTER 3 = OTHER (*Specify*) _____
[1] 1 = SOFT 2 = HARD 3 = OTHER (*Specify*) _____
[2] 1 = WHITE 2 = RED 3 = OTHER (*Specify*) _____

3. SEASON - NUMBER OF DAYS FROM EMERGENCE TO:
[2][3][6] FIRST FLOWERING
[2][4][2] LAST FLOWERING

4. MATURITY (*50% Flowering*):
[0][4] NO. OF DAYS *EARLIER* THAN Argee [ ] 1 = ARTHUR 2 = SCOUT 3 = CHRIS
[0][4] NO. OF DAYS *LATER* THAN Caldwell [ ] 4 = LEMHI 5 = NUGAINES 6 = LEEDS
(None grown in Wisconsin)

5. PLANT HEIGHT (*From soil level to top of head*):
[0][8][9] CM. HIGH
[0][3] CM. TALLER THAN Caldwell [ ] (None grown in Wisconsin)
[0][7] CM. SHORTER THAN Argee [ ] 1 = ARTHUR 2 = SCOUT 3 = CHRIS 4 = LEMHI 5 = NUGAINES 6 = LEEDS

6. PLANT COLOR AT BOOTING (*See reverse*):
[2] 1 = YELLOW GREEN 2 = GREEN 3 = BLUE GREEN

7. ANTHER COLOR:
[1] 1 = YELLOW 2 = PURPLE

8. STEM:
[1] Anthocyanin: 1 = ABSENT 2 = PRESENT
[2] Waxy bloom: 1 = ABSENT 2 = PRESENT
[1] Hairiness of last internode of rachis: 1 = ABSENT 2 = PRESENT
[1] Internodes: 1 = HOLLOW 2 = SOLID
[0][4] NO. OF NODES (*Originating from node above ground*)
[2][2] CM. INTERNODE LENGTH BETWEEN FLAG LEAF AND LEAF BELOW

9. AURICLES:
[1] Anthocyanin: 1 = ABSENT 2 = PRESENT
[1] Hairiness: 1 = ABSENT 2 = PRESENT

10. LEAF:
[2] Flag leaf at booting stage: 1 = ERECT 2 = RECURVED 3 = OTHER (*Specify*): _____
[2] Flag leaf: 1 = NOT TWISTED 2 = TWISTED
[1] Hairs of first leaf sheath: 1 = ABSENT 2 = PRESENT
[2] Waxy bloom of flag leaf sheath: 1 = ABSENT 2 = PRESENT
[1][0] MM. LEAF WIDTH (*First leaf below flag leaf*)
[2][9] CM. LEAF LENGTH (*First leaf below flag leaf*)

9200214

11. HEAD:

[1] Density: 1 = LAX 2 = DENSE

[4] Shape: 1 = TAPERING 2 = STRAP 3 = CLAVATE 4 = OTHER (Specify) OBLONG

[4] Awnedness: 1 = AWNLESS 2 = APICALLY AWNLETED 3 = AWNLETED 4 = AWNED

[1] Color at maturity: 1 = WHITE 2 = YELLOW 3 = PINK 4 = RED 5 = BROWN 6 = BLACK 7 = OTHER (Specify): _____

[1][0] CM. LENGTH

[1][2] MM. WIDTH

12. GLUMES AT MATURITY:

[3] Length: 1 = SHORT (CA. 7 mm.) 2 = MEDIUM (CA. 8 mm.) 3 = LONG (CA. 9 mm.)

[3] Width: 1 = NARROW (CA. 3 mm.) 2 = MEDIUM (CA. 3.5 mm.) 3 = WIDE (CA. 4 mm.)

[2] Shoulder shape: 1 = WANTING 2 = OBLIQUE 3 = ROUNDED 4 = SQUARE 5 = ELEVATED 6 = APICULATE

[3] Beak: 1 = OBTUSE 2 = ACUTE 3 = ACUMINATE

13. COLEOPTILE COLOR:

[1] 1 = WHITE 2 = RED 3 = PURPLE

14. SEEDLING ANTHOCYANIN:

[1] 1 = ABSENT 2 = PRESENT

15. JUVENILE PLANT GROWTH HABIT:

[2] 1 = PROSTRATE 2 = SEMI-ERECT 3 = ERECT

16. SEED:

[1] Shape: 1 = OVATE 2 = OVAL 3 = ELLIPTICAL

[1] Cheek: 1 = ROUNDED 2 = ANGULAR

[1] Brush: 1 = SHORT 2 = MEDIUM 3 = LONG

[1] Brush: 1 = NOT COLLARED 2 = COLLARED

[5] Phenol reaction (See instructions): 1 = IVORY 2 = FAWN 3 = LT. BROWN 4 = BROWN 5 = BLACK

[3] Color: 1 = WHITE 2 = AMBER 3 = RED 4 = PURPLE 5 = OTHER (Specify) _____

[0][6] (6.4) MM. LENGTH

[0][3] MM. WIDTH

[2][8] GM. PER 1000 SEEDS

17. SEED CREASE:

[2] Width: 1 = 60% OR LESS OF KERNEL 'WINOKA' 2 = 80% OR LESS OF KERNEL 'CHRIS' 3 = NEARLY AS WIDE AS KERNEL 'LEMHI' BBGL JCDB

[1] Depth: 1 = 20% OR LESS OF KERNEL 'SCOUT' 2 = 35% OR LESS OF KERNEL 'CHRIS' 3 = 50% OR LESS OF KERNEL 'LEMHI'

18. DISEASE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

[2] STEM RUST (Races) HNLQ HJCS QFBS RHRS QSHS

[2] LEAF RUST (Races) BBBL DBBB LBGG LBBQ LCBQ LLGG

[0] STRIPE RUST (Races) _____

[0] LOOSE SMUT

[2] POWDERY MILDEW

[2] BUNT

[2] OTHER (Specify) Barley Yellow Dwarf Virus

19. INSECT: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

[0] SAWFLY

[0] APHID (Dydv.)

[0] GHE SOG

[0] CEREAL LEAF BEETLE

[1] OTHER (Specify) Hession Fly "L"

HESSIAN FLY RACES: [1] GP [0] A [1] B [1] C [1] D [1] E [0] F [0] G

20. INDICATE WHICH VARIETY MOST CLOSELY RESEMBLES THAT SUBMITTED:

CHARACTER	NAME OF VARIETY	CHARACTER	NAME OF VARIETY
Plant tillering	Argee	Seed size	Argee
Leaf size	Argee	Seed shape	Argee
Leaf color	Argee	Coleoptile elongation	Argee
Leaf carriage	Argee	Seedling pigmentation	Argee

RECEIVED USDA AMS JUN 18 1992 Plant Variety Protection Office

INSTRUCTIONS

GENERAL: The following publications may be used as a reference aid for the standardization of terms and procedures for completing this form:

(a) L.W. Briggle and L. P. Reitz, 1963, Classification of Triticum Species and Wheat Varieties Grown in the United States, Technical Bulletin 1278, United States Department of Agriculture.

(b) W.E. Walls, 1965, A Standardized Phenol Method for Testing Wheat Seeds for Varietal Purity, Contribution No. 28 to the Handbook of seed testing prepared by the Association of Official Seed Analysts. (See attachment)

LEAF COLOR: Nickerson's or any recognized color fan should be used to determine the leaf color of the described variety.

6

EXHIBIT D: ADDITIONAL DESCRIPTION OF GLACIER

1. Botanical Description of the Variety.

Glacier is classified as Triticum aestivum L. em Thell. Plants are intermediate in height and moderately stiff. It has intermediate to long leaves consisting of blade, ligule, and sheath, all of which are glabrous. Stems are hollow. Spikes are middense, erect, long, and of uniform width (oblong). Glumes are glabrous, long, and wide with an acuminate beak and an oblique shoulder. The lemma of each floret terminates in a beard, and the caryopsis (seed) threshes free from the lemma and palea. Seeds are moderately large and ovate with rounded cheecks and a midsized to large germ. The crease is midwide, about 60% of kernel width. The crease depth, from the crest of the checks to the position where the crease is closed, is shallow. The brush is short and not collared. Seeds are red and straw is light yellow to white at maturity.

2. Growth Habit and Performance

(a) Growth Habit

Glacier is a soft red winter wheat. It is planted in September and produces 3 to 5 seedling leaves during a typical Wisconsin fall season. Following vernalization during the winter months, growth resumes in April with an average heading date of June 1 at Madison and June 7-8 on a statewide basis.

(b) Performance Data

Yield, agronomic, and disease data for Glacier and several other soft red winter wheat cultivars evaluated in Wisconsin statewide tests in 1989, 1990, and 1991 are summarized below:

Grain Yield (B/A)
1989-90-91

	Location							
Cultivar	Arl. Drill Plot	Mad. Nurs.	Ash-land	Lan-caster	Marsh-field	Spooner	Stur-geon Bay	7-Loc. wted. avg.
(No. of Tests)	3	3	2	3	2	2	3	18
Glacier	61.8	62.6	55.3	42.7	37.8	33.8	50.3	50.3
Argee	53.1	56.0	50.5	33.4	37.3	29.7	46.4	44.5
Caldwell	61.9	65.3	52.7	41.6	41.2	30.0	46.1	49.6
Cardinal	68.0	65.1	52.5	42.1	47.8	35.4	46.1	52.0
Dynasty	65.8	61.2	50.6	41.8	38.0	32.8	47.3	49.5
Excel	64.2	57.9	49.9	39.8	39.3	30.2	50.1	48.6
Howell	70.7	67.1	61.9	40.9	49.6	36.4	47.8	54.2
Merrimac	56.3	56.8	49.5	37.3	45.0	30.7	47.9	46.9
Average	62.7	61.5	52.9	40.0	42.0	32.4	47.8	

Glacier has outyielded Argee by nearly 6 b/a (50.3 vs. 44.5) over all seven locations during this 3-year period.

Agronomic and disease data for Glacier and several other soft red winter wheat cultivars evaluated in Wisconsin tests in 1989, 1990, and 1991 are summarized below:

Cultivar	Yield B/A	Bu. wt. Lbs.	Head date June	Ripe date July	Plant ht. in.	cm.	Snap-back 1=weak 10=stiff	Lodging %	Leaf rust %	Bunt %	Winter survival %
No. of Stn. Yrs.	18	18	14	6	18		3	6	6	3	6
Glacier	50.3	54.2	7.4	20.0	34.3	85.8	7.8	15.8	3.7	0.8	87.5
Argee	44.5	53.1	10.5	22.3	37.2	93.0	7.0	21.4	5.0	17.2	90.1
Caldwell	49.6	54.5	4.3	18.9	33.1	82.8	7.7	14.4	2.2	19.2	79.2
Cardinal	52.0	54.7	7.1	20.1	34.5	86.3	7.1	19.3	13.2	3.2	79.1
Dynasty	49.5	54.8	5.4	20.9	33.1	83.8	7.3	10.8	44.0	28.8	84.9
Excel	48.6	51.9	6.5	20.9	31.5	78.8	8.2	3.0	26.0	21.8	84.5
Howell	54.2	57.7	6.5	20.2	35.2	88.0	7.9	13.4	29.0	15.0	87.1
Merrimac	46.9	54.2	10.1	21.8	36.7	91.8	7.2	23.6	3.7	3.5	86.7
Average	49.5	54.4	7.2	20.6	34.5	86.1	7.5	15.2	15.9	13.7	84.9

The values for Glacier are close to the eight-cultivar means for grain yield, test weight, heading date, ripening date, plant height, and lodging. Glacier has higher snap-back (stiffer), lower leaf rust and lower bunt infection, and higher winter survival than the eight-cultivar mean values.

8

Winter Hardiness:

Winter hardiness is essential for superior performance in Wisconsin although the degree of winter kill varies from season to season. Survival rates recorded in April 1990 (tabulated below) reflect cultivar response to below-zero temperatures, no snow cover, and high winds during late December 1989 at Madison, WI:

Winter Survival (%)

	Main Yield Trial	Trip Series	Singles Series	3-Test Mean
Glacier	90.8	95.3	90.0	92.0
Argee	93.5	93.0	98.0	94.8
Caldwell	82.5	58.3	55.0	65.3
Cardinal	79.8	78.3	89.0	82.4
Dynasty	82.3	48.3	80.0	70.2
Excel	78.8	-	-	-
Merrimac	90.3	93.3	92.0	91.9
Howell	81.5	-	-	-

The excellent winter hardiness of Glacier is readily apparent.

Leaf Rust Reaction:

Glacier possesses leaf rust resistance gene Lr3, based on seedling reaction to selected races of Puccinia recondita f. sp. tritici in tests at the USDA-ARS Cereal Rust Laboratory, St. Paul, MN. Consequently, Glacier is resistant to those races of this pathogen which are not virulent on Lr3. Isolates which were tested and to which Glacier gave a resistant reaction are listed below:

1989	1990	1991
JCDB	DBBB	LLGG
BBGL	LBBQ	BBBL
		LBGG
		LCBQ

(See page 37 of the 1988-89 UESRWWN Report.)
(See page 53 of the 1989-90 UESRWWN Report.)
(See page 50 of the 1990-91 UESRWWN Report.)

Glacier has shown excellent resistance to leaf rust in 14 tests in the Madison-Arlington field nurseries during 1987-1991. On a 0 to 100 scale, the average infection for Glacier was 3.1 compared to 4.6 for Merrimac, 7.2 for Argee, and 39.0 for Dynasty.

Stem Rust Reaction: Glacier possess some resistance to stem rust based on seedling reaction to selected races of Puccinia graminis f. sp. tritici in tests at the USDA-ARS Cereal Rust Laboratory, St. Paul, MN. The exact gene or genes present has not been determined. Glacier has shown a moderate degree of resistance to the following isolates:

1989	1990	1991
HJCS	HNLQ	HNLQ
QFBS	QFBS	QFBS
QSHS	QSHS	QSHS
RHRS		
RKQS		
RTQQ		

(See page 40 of the 1988-89 UESRWWN Report.)
(See page 54 of the 1989-90 UESRWWN Report.)
(See page 52 of the 1990-91 UESRWWN Report.)

Reaction to the Barley Yellow-Dwarf Virus: Glacier has received intermediate scores to the BYDV in tests as Urbana, IL. Glacier demonstrated excellent tolerance in the 1990 Madison nursery when natural infection was severe.

Bunt: Glacier is very resistant to this fungus, Tilletia carces. Advanced breeding selections are evaluated in a two-rep test each year at Wisconsin. The reactions of Glacier (very resistant), Argee (susceptible), and Merrimac (resistant) are compared below:

Bunt Reaction

	Glacier		Argee		Merrimac	
	No. of tests	Mean infection %	No. of	Mean infection %	No. of tests	Mean infection %
1987	1	2.0	4	77.3	3	9.3
1988	1	0.5	4	27.8	4	1.6
1989	1	0.5	4	10.1	4	3.5
1990	3	0.7	4	25.8	4	3.4
1991	3	0.0	4	19.3	4	2.5
Unwted. Mean		0.7		32.1		4.1

Milling and Baking Quality: Glacier has excellent soft wheat milling and baking quality. Milling and baking quality scores determined in annual assays conducted by the USDA Soft Wheat Quality Laboratory, Wooster, OH, are tabulated below:

Milling and baking scores (M/B) for several soft red winter wheat varieties and Wisconsin selection X1625-1-1 (Glacier) in several Wisconsin tests during 1988-91 at Madison and Arlington, Wisconsin.

	Argee	Merrimac	Glacier	Caldwell	Cardinal	Dynasty	Excel	Howell
1988 Mad. RR	A/A	C/F	C/A	A/A	A/A	C/D	- -	C/F
1989 Arl. DP	- -	- -	C/D	A/A	- -	C/C	- -	C/F
1989 Mad. RR	-	B/A	B/A	A/A	B/C	C/C	- -	C/F
1990 Mad. RR	A/B	B/C	A/A	A/E	A/E	B/D	B/D	A/F
1990 Mad. Trips	A/A	A/A	A/A	A/B	A/B	A/B	- -	- -
1991 Arl. DP	B/E	C/E	A/A	A/F	B/F	D/F	B/E	B/F
1991 Mad. YT	B/F	C/F	A/A	A/F	C/F	B/F	B/F	B/F
1991 Mad. RR (micro)	A/A	C/A	A/A	B/A	A/A	B/B	B/A	B/D
1991 Mad. Trips	-	- -	A/A	B/B	A/C	- -	- -	- -
1991 Mad. Singles	-	- -	A/A	B/D	B/D	- -	- -	- -

In 1990 and 1991 Wisconsin tests, Glacier had higher milling and baking scores (A/A) than the other six cultivars evaluated including Argee which has been the high-quality standard for many years.

The excellent milling and baking quality of Glacier was further demonstrated by its No. 1 rnaking among 38 entries in the 1989 UESRWWN. Seeds from seven locations were bulked, and the bulk seed lots were then evaluated at the Wooster Lab. A No. 1 ranking among these elite breeding selections is a worthy accomplishment. The following three pages reveal the bases for the No. 1 ranking - including an unusually high baking quality score (108.3) (influenced in part by high cookie diameter (17.91)) and high flour yields (40.03 and 77.59).

USDA UNIFORM -11- NURSERY Rec 2/5/92

1989 CROP 9200214

(BULK OF SEED FROM 7 STATES)

(2)

A.W.R.C. values were very low with one exception, entry #336 (T34). This entry had an A.W.R.C. OF 56.4 %.

There were 11 of the entries grown in 1989 that were repeated from 1988. Their rankings are included in the following table:

ENTRIES RANKED ACCORDING TO COMBINED QUALITY SCORE

	89	88	87	86	85
WI X1625-1-1 = GLACIER	1	-	-	-	-
VERNE (KY 83-38)	2	6	-	-	-
PUR 79424H1-20-2-74	3	9	-	-	-
NASW 85-294	3	-	-	-	-
T8-1-2	5	-	-	-	-
MO 11785	6	-	-	-	-
CALDWELL	7	-	-	-	-
PSR-W32	8	-	-	-	-
COKER 31-61	9	-	-	-	-
ILL 84-3511	10	-	-	-	-
CL 860426 (COKER 9543)	11	-	-	-	-
COKER 86-33	12	-	-	-	-
WAKEFIELD	13	-	-	-	-
PA 8457-1	14	-	-	-	-
MD 75191-80	15	29	-	-	-
MO 10501	16	15	-	-	-
CARDINAL	17	-	-	-	-
MADISON	18	-	-	-	-
SAWYER (NASW 85-81)	19	-	-	-	-
EXCEL (OH286)	20	2	10	-	-
PSR-W36	21	-	-	-	-
MD 55-111-83	22	-	-	-	-
OH 394	23	11	-	-	-
NASW 85-94	24	-	-	-	-
PUR 76754RG1-9-9-1	25	-	-	-	-
ILL 84-3010	26	-	-	-	-
FREEDOM (OH 413)	27	-	-	-	-
MD 75266-46	28	-	-	-	-
PION. 2548	29	-	-	-	-
KNOX 62	30	3	2	13	14
NASW 85-96	31	-	-	-	-
PSR-W7	32	-	-	-	-
T34	33	-	-	-	-
MO 11769	34	-	-	-	-
MD 73065-03	35	25	14	-	-
IL 84-2518	36	28	-	-	-
VORIS 2-C-27	37	33	-	-	-
AR 26415	38	34	-	-	-

11

9200214

PAGE 1

DATA RANKED ACCORDING TO COMBINED QUALITY SCORE

SOFT WHEAT QUALITY EVALUATION

FOR WHEAT AND MILLING QUALITY

1989 CROP

UNIFORM EASTERN
SOFT RED NURSERY

STANDARD = #303, CALDWELL

SAMPLE NO.	ENTRY	MILLING QUALITY SCORE	BAKING QUALITY SCORE	COMBINED QUALITY SCORE	TEST WT. LB/BU.	BREAK FLOUR YIELD	ST. GR. FLOUR YIELD	RED. PASS	E.S.I.	FRIAB.	FLOUR ASH	MILLAB.
328	WI X1625-1-1	104.9 A	108.3 A	104.9 A	58.7	40.03	77.59	7	10.14	29.46	0.446 Q	106.49
312	12 VERNE (KY 83-38)	105.0 A	102.5 A	102.5 A	59.5	38.49	77.12	7	9.73	29.65	0.418 *	111.33
311	11 PUR 79424H1-20-2-74	101.4 A	101.0 A	101.0 A	57.5	36.12	76.70	7	9.53	28.82	0.399	111.51
317	17 NASW 85-294	102.6 A	101.0 A	101.0 A	60.2	35.19 *	77.02	7	10.07	29.34	0.422 *	108.53
335	35 T8-1-2	100.9 A	103.7 A	100.9 A	59.3	37.67	77.26	7	10.41	28.83	0.426 Q	106.48
319	19 MO 11785	103.5 A	100.4 A	100.4 A	60.9	35.36	77.09	7	9.94	29.43	0.408 *	111.86
303	3 CALDWELL	100.0 A	100.0 A	100.0 A	58.7	38.92	76.74	7	10.35	29.14	0.379	113.73
*	0 STANDARD	100.0 A	100.0 A	100.0 A	58.7	38.92	76.74	7	10.35	29.14	0.379	113.73
333	33 PSR-W32	102.2 A	99.5 B	99.5 B	60.4	38.36	77.12	7	10.41	29.45	0.423 *	108.12
331	31 COKER 31-61	105.0 A	98.9 B	98.9 B	58.8	33.83 *	77.44	7	10.14	29.67	0.446 Q	106.44
326	26 ILL 84-3511	98.7 B	100.7 A	98.7 B	58.8	35.22 *	76.77	7	10.41	28.75	0.412 *	107.08
338	38 CL 860426 (COKER 9543)	103.0 A	97.3 B	97.3 B	60.7	32.79 *	76.93	7	10.35	29.90	0.412 *	110.69
337	37 COKER 86-33 (COKER 9803)	98.0 B	96.9 B	96.9 B	61.2	34.07 *	76.51	7	10.69	29.12	0.426 Q	103.91 *
324	24 WAKEFIELD	97.9 B	95.5 B	95.5 B	58.8	35.36	76.61	7	10.28	28.54	0.393	109.54
327	27 PA 8457-1	98.7 B	95.3 B	95.3 B	60.4	33.82 *	77.00	7	10.55	28.58	0.400	109.14
*	BENCHMARK	94.6 C	100.7 A	94.6 C	61.6	35.00 *	76.60	8	10.40	27.60 *	0.349	114.31
305	5 MD 75191-80	106.0 A	93.6 C	93.6 C	57.6	34.71 *	77.37	7	9.26	29.23	0.427 Q	110.74
313	13 MO10501	93.3 C	101.1 A	93.3 C	59.3	36.99	76.31	7	11.50 Q	28.69	0.425 Q	100.20 *
302	2 CARDINAL	102.8 A	93.2 C	93.2 C	58.5	35.12 *	76.82	7	9.50	29.08	0.360	119.38
323	23 MADISON	100.4 A	92.6 C	92.6 C	58.9	31.87 *	76.61	7	10.14	29.24	0.388	112.59
314	14 SAWYER (NASW 85-81)	96.7 B	92.4 C	92.4 C	58.0	35.15 *	76.45	7	10.69	28.79	0.441 Q	100.16 *
304	4 EXCEL (OH 286)	94.0 C	92.0 C	92.0 C	57.7	40.15	76.32	7	10.89	28.27 *	0.430 Q	99.75 *
334	34 PSR-W36	93.7 C	91.6 C	91.6 C	58.6	34.13 *	76.15 *	7	10.76	28.23 *	0.438 Q	98.01 *
329	29 MD 55-111-83	90.3 C	89.6 D	89.6 D	59.1	38.26	76.17 *	7	11.44 *	27.79 *	0.465 Q	90.62 Q
310	10 OH 394	97.9 B	88.8 D	88.8 D	59.4	34.93 *	76.62	7	10.21	28.46	0.420 *	104.84
315	15 NASW 85-94	88.2 D	88.9 D	88.2 D	55.8 *	36.01	75.81 *	7	11.30 *	27.43 Q	0.432 Q	94.40 Q
322	22 PUR 76754RG1-1-9-1	102.0 A	87.4 D	87.4 D	60.0	32.55 *	77.20	7	9.94	28.79	0.411 *	110.04
325	25 ILL 84-3010	101.7 A	87.0 D	87.0 D	58.2	33.99 *	77.02	7	10.48	29.48	0.393	112.94
320	20 FREEDOM (OH 413)	84.9 E	86.0 D	84.9 E	57.2	33.56 *	75.22 Q	7	11.84 Q	27.65 *	0.400	97.19 *
330	30 MD 75266-46	89.0 D	84.6 E	84.6 E	58.3	35.32 *	76.04 *	7	11.64 Q	27.75 *	0.485 Q	86.09 Q
321	21 PIONEER 2548	87.5 D	83.9 E	83.9 E	58.1	36.19	75.39 Q	7	11.16 *	27.58 *	0.412 *	97.32 *
301	1 KNOX 62	88.9 D	83.7 E	83.7 E	60.3	32.83 *	75.65 Q	7	11.23 *	27.79 *	0.386	103.00 *
316	16 NASW 85-96	83.2 E	82.0 E	82.0 E	55.5 *	35.13 *	75.32 Q	7	12.39 Q	27.52 Q	0.486 Q	80.83 Q
332	32 PSR-W7	97.0 B	81.7 E	81.7 E	56.2 *	33.94 *	76.39	7	10.28	28.54	0.436 Q	101.22 *
336	36 T34	81.7 E	82.7 E	81.7 E	57.1	38.76	75.53 Q	7	12.86 Q	27.26 Q	0.419 *	91.42 Q
318	18 MO 11769	81.1 E	82.1 E	81.1 E	58.7	33.54 *	75.82 *	8	12.35 Q	26.17 Q	0.411 *	92.28 Q
306	6 MD 73065-03	78.7 F	84.9 D	78.7 F	57.5	37.27	75.09 Q	8	11.91 Q	25.85 Q	0.448 Q	83.62 Q
308	8 IL-84-2518	80.0 E	77.4 F	77.4 F	58.5	34.84 *	74.59 Q	7	12.52 Q	27.55 *	0.416 *	90.22 Q
309	9 VORIS 2-C-27	92.0 C	75.0 F	75.0 F	59.0	31.62 Q	76.15 *	7	11.23 *	28.16 *	0.425 *	99.04 *
307	7 AR 26415	77.0 F	73.4 F	73.4 F	59.4	35.19 *	74.23 Q	7	12.52 Q	27.00 Q	0.426 Q	85.81 Q

9200214

PAGE 1

DATA RANKED ACCORDING TO COMBINED QUALITY SCORE

SOFT WHEAT QUALITY EVALUATION

FOR FLOUR AND BAKING QUALITY

1989 CROP

UNIFORM EASTERN
SOFT RED NURSERY

STANDARD = #303, CALDWELL

SAMPLE NO.	ENTRY	BAKING QUALITY SCORE	COMBINED QUALITY SCORE	BREAK FLOUR %	FLOUR PROTEIN %	FLOUR ASH %	MICRO A.W.R.C. %	TOP GR.	COOKIE DIAMETER CM.
328	WI X1625-1-1	108.3 A	104.9 A	40.03	8.79	0.446 Q	49.90	1	17.91
312	12 VERNE (KY 83-38)	102.5 A	102.5 A	38.49	8.66	0.418 *	52.80	1	17.78
311	11 PUR 79424H1-20-2-74	101.0 A	101 A	36.12	8.96	0.399	51.70	1	17.77
317	17 NASW 85-294	101.0 A	101 A	35.19 *	9.63 *	0.422 *	51.00	1	17.94
335	35 T8-1-2	103.7 A	100.9 A	37.67	8.90	0.426 Q	51.80	1	17.9
319	19 MO 11785	100.4 A	100.4 A	35.36	9.33 *	0.408 *	51.70	1	17.95
303	3 CALDWELL	100.0 A	99.99 A	38.92	8.73	0.379	52.80	1	17.7
*	0 STANDARD	100.0 A	99.99 A	38.92	8.73	0.379	52.80	1	17.7
333	33 PSR-W32	99.5 B	99.48 B	38.36	8.68	0.423 *	51.60	1	17.64
331	31 COKER 31-61	98.9 B	98.91 B	33.83 *	8.77	0.446 Q	50.20	1	17.97
326	26 ILL 84-3511	100.7 A	98.74 B	35.22 *	8.55	0.412 *	51.50	1	17.93
338	38 CL 860426 (COKER 9543)	97.3 B	97.33 B	32.79 *	8.87	0.412 *	50.20	1	18
337	37 COKER 86-33 (COKER 9803)	96.9 B	96.85 B	34.07 *	9.55 *	0.426 Q	52.40	1	17.82
324	24 WAKEFIELD	95.5 B	95.51 B	35.36	8.68	0.393	51.10	4	17.64
327	27 PA 8457-1	95.3 B	95.33 B	33.82 *	9.57 *	0.400	52.90	1	17.86
*	BENCHMARK	100.7 A	94.62 C	35 *	8.20	0.349	51.30	7	18.35
305	5 MD 75191-80	93.6 C	93.58 C	34.71 *	7.47	0.427 Q	52.10	1	17.66
313	13 MO10501	101.1 A	93.34 C	36.99	8.79	0.425 Q	52.50	1	17.83
302	2 CARDINAL	93.2 C	93.17 C	35.12 *	8.60	0.360	51.50	5	17.6
323	23 MADISON	92.6 C	92.59 C	31.87 *	9.16	0.388	48.90	6	17.7
314	14 SAWYER (NASW 85-81)	92.4 C	92.39 C	35.15 *	8.39	0.441 Q	50.50	1	17.57
304	4 EXCEL (OH 286)	92.0 C	91.98 C	40.15	9.27 *	0.430 Q	53.80	5	17.51
334	34 PSR-W36	91.6 C	91.63 C	34.13 *	9.38 *	0.438 Q	51.00	1	17.59
329	29 MD 55-111-83	89.6 D	89.61 D	38.26	8.78	0.465 Q	52.00	1	17.42
310	10 OH 394	88.8 D	88.77 D	34.93 *	9.62 *	0.420 *	52.60	6	17.56
315	15 NASW 85-94	88.9 D	88.22 D	36.01	8.98	0.432 Q	54.30	1	17.62
322	22 PUR 76754RG1-1-9-1	87.4 D	87.44 D	32.55 *	9.86 Q	0.411 *	53.00	1	17.64
325	25 ILL 84-3010	87.0 D	87.02 D	33.99 *	8.35	0.393	51.20	1	17.48
320	20 FREEDOM (OH 413)	86.0 D	84.9 E	33.56 *	8.13	0.400	53.60	4	17.6
330	30 MD 75266-46	84.6 E	84.57 E	35.32 *	7.85	0.485 Q	52.60	1	17.44
321	21 PIONEER 2548	83.9 E	83.9 E	36.19	8.61	0.412 *	54.00	1	17.47
301	1 KNOX 62	83.7 E	83.66 E	32.83 *	9.73 Q	0.386	51.00	1	17.44
316	16 NASW 85-96	82.0 E	82 E	35.13 *	8.28	0.486 Q	54.30	1	17.48
332	32 PSR-W7	81.7 E	81.75 E	33.94 *	9.28 *	0.436 Q	50.30	1	17.35 *
336	36 T34	82.7 E	81.71 E	38.76	8.84	0.419 *	56.40 Q	1	17.48
318	18 MO 11769	82.1 E	81.14 E	33.54 *	8.75	0.411 *	52.50	1	17.44
306	6 MD 73065-03	84.9 D	78.72 F	37.27	9.13	0.448 Q	54.10	1	17.46
308	8 IL-84-2518	77.4 F	77.44 F	34.84 *	9.65 *	0.416 *	52.60	1	17.28 *
309	9 VORIS 2-C-27	75.0 F	75.05 F	31.62 Q	9.53 *	0.425 *	51.50	1	17.28 *
307	7 AR 26415	73.4 F	73.4 F	35.19 *	10.14 Q	0.426 Q	53.20	1	17.2 *

9200214

University of Wisconsin-Madison

College of Agricultural and Life Sciences
Department of Agronomy
1575 Linden Drive
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Phone: 608-262-1390/1391
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Improving Agriculture Through Crop Biotechnology, Genetics and Production Research

August 28, 1991

TO: Agronomy Department Chairpersons, North Central Region, and Soft Red Winter Wheat Breeders and Cooperators

FROM: R.E. Doersch, Chairperson, Department of Agronomy, University of Wisconsin-Madison R. E. Doersch

SUBJECT: Release of Soft Red Winter Wheat "Glacier" (X1625-1-1)

The Wisconsin Agricultural Experiment Station plans to release soft red winter wheat selection X1625-1-1 for planting by certified seed growers this current fall (1991). The name "Glacier" has been proposed for this bearded, white-chaffed wheat.

The pedigree of Glacier is

OH 112/Argee/2/Argee

= Logan/Benhur sib/2/Argee/3/Argee

Ohio selection OH 112 was an entry in the Uniform Eastern Soft Red Winter Wheat Nursery (UESRWWN) in 1978, 1979, and 1980. The first cross with Argee was made in 1978 and the backcross to Argee was made in 1979.

Glacier has been evaluated as Wisconsin selection X1625-1-1 in advanced performance trials in Wisconsin since 1988. It was an entry in the UESRWWN in 1989, 1990, and 1991.

Glacier has higher grain yield averages than both Argee and Merrimac while retaining the high level of winter hardiness typical of Argee and Merrimac which is needed in many areas of Wisconsin. It is 2 to 4 days earlier, 2 to 5 inches shorter, and has stiffer straw than Argee and Merrimac, all three desirable attributes. Glacier also has excellent milling and baking quality (Table 4).

In 30 station-year tests conducted statewide during 1989, 1990, and 1991, the grain yield of Glacier exceeded that of Argee in 28 (93%) and of Merrimac in 24 (80%). In 18 tests conducted at seven UW Agricultural Research Stations, the 3-year average yield of Glacier was exceeded only by that of Cardinal (+1.8 bu.) and Howell (+3.6bu.) (Table 1). In 12 tests conducted by Dr. E.S. Oplinger (Table 2), the 3-year average yield of Glacier was exceeded by Cardinal and Dynasty (+1.0 bu.) and Howell (+3.1 bu.). Glacier performed especially well at Ashland, Spooner, Sturgeon Bay, Lancaster, and Racine.

Agronomic and disease data are summarized in Table 3. In Wisconsin tests, Glacier has demonstrated excellent winter hardiness and high levels of resistance to leaf rust, the barley yellow dwarf virus, and bunt. It is intermediate in reaction to stem rust, which is rarely a problem in Wisconsin, and is susceptible to Hessian Fly biotypes E, L, B, and GP.

14

Requests for seed for testing purposes or for Foundation Seed allotments should be directed to Dr. David E. Freund, Director, Wisconsin Foundation Seeds, Room 562 Moore Hall, 1575 Linden Drive, Madison, WI 53706. (608-262-1376)

RELEASE SPECIFICATIONS FOR GLACIER WHEAT

Glacier will be a licensed cultivar. In addition to Plant Variety Protection (via seed certification), the following specifications accompany the release of Glacier wheat:

1) There will be only three classes of seed -- Beeder, Foundation, and Certified.

2. The Wisconsin Crop Improvement Association has been delegated authority to license production of the Certified Class of Seed of Glacier and to serve as the collection agent for a research and development fee.

3) The annual license fee for Glacier wheat shall be $25.00.

4) A research and development fee of $.25 will be assessed and collected for each bushel of Glacier for which a Certified Seed tag is issued.

5) The Wisconsin Crop Improvement Association may authorize other Crop Improvement Associations or Foundation Seed Organizations to act as sub-licensing and fee-collection agents. To this end, the WCIA will enter into the following licensing or sub-licensing agreements:

   a) A nonfee, permanent agreement with Foundation Seed Organizations in other states.

   b) An annual, sub-licensing agreement with Crop Improvement Associations in other states. These Crop Improvement Associations may then license individual Growers in their respective states.

   c) An annual licensing agreement with individual Wisconsin Seed Growers.

   Please direct inquiries to Mr. Eugene R. Amberson, Manager, Wisconsin Crop Improvement Association, Room 560 Moore Hall, 1575 Linden Drive, Madison, WI 53706. (608-262-0167)

6) License fees collected in another state may be retained by the licensing agent for that state.

7) Research and development fees collected by another state will be shared 50:50, with the 50% retained by that state to be used for research and development as specified by the Director of the State Agricultural Experiment Station, the other 50% to be returned to the Wisconsin Crop Improvement Association by September 1 of each year.

8) The Director of Wisconsin's Foundation Seed Program must have in hand a copy of the appropriate signed "license/fee-collection agreement" for Glacier wheat prior to the sale of Breeder Seed or Foundation Seed of Glacier wheat to a Foundation Seed Organization or an individual Seed Grower.

Table 1. Grain yields (b/a) of several soft red winter wheat varieties and Wisconsin selection X1625-1-1 (Glacier) for 3 years (1989-90-91) at seven locations in Wisconsin.

	Arl. drill plots	Mad. nurs.	Ashland	Lan-caster	Marsh-field	Spooner	St. Bay	7-Location mean
3-year avg. (89-90-91)			1/		2/	1/		(Unweighted) 3-year mean
Argee	53.1	56.0	50.6	33.4	37.3	29.7	46.4	44.5
Merrimac	56.3	56.8	49.5	37.3	45.0	30.7	47.9	47.5
Glacier	61.8	62.6	55.4	42.7	37.8	33.9	50.2	50.4
Caldwell	61.9	65.3	52.8	41.6	41.2	30.0	46.1	49.3
Cardinal	68.0	65.1	52.6	42.1	47.8	35.5	46.1	52.2
Dynasty	65.8	61.2	50.6	41.8	38.0	32.9	47.3	49.7
Excel	64.2	57.9	49.9	39.8	39.4	30.2	50.1	48.6
Howell	70.7	67.1	62.0	40.9	49.6	36.5	47.8	54.0

1/ Two year average, 1989 and 1991.
2/ Two year average, 1990 and 1991.

Table 2. Grain yields (b/a) of several soft red winter wheat varieties and Wisconsin selection X1625-1-1 (Glacier) for 3 years (1989-90-91) at four locations in Wisconsin. Data from Dr. E. S. Oplinger.

	Arlington	Janesville	Racine	Chilton	Grand mean (12 stn-years)
3-year avg. (89-90-91)					
Argee	45.5	48.2	66.7	58.4	54.7
Merrimac	49.2	48.9	69.7	65.9	58.4
Glacier	54.2	56.0	74.3	73.4	64.5
Caldwell	57.6	59.2	69.6	68.2	63.7
Cardinal	58.6	57.8	74.6	70.9	65.5
Dynasty	52.9	60.2	75.8	73.2	65.5
Howell	61.2	57.7	78.6	72.8	67.6

Table 3. Agronomic and disease data for several soft red winter wheat varieties and Wisconsin selection X1625-1-1 (Glacier) in 1989 and 1990 at Arlington and Madison, Wisconsin.

	Winter Surv. %		Test wt. lbs.		Head date June		Ripe date July	Plant ht. in.		Snap-back 1.0=weak 9.0=stiff	Lodging %		Leaf rust 0-100		Stem rust 0=resis. 9=susc.		BYD virus 0=resis. 9=susc.	Bunt %
	Arl.	Mad.	Arl.	Mad.	Arl.	Mad.	Mad	Arl.	Mad.	Mad.	Arl.	Mad.	Arl.	Mad.	Mad.	Lan.	Mad.	Mad.
											(1991)		(89-90-91)		(1989)		(1990)	
Argee	96	91	51	55	13	11	22	37	38	7.3	11	11	2.2	7.8	2.3	3.0	0.3	17
Merrimac	92	94	52	56	13	9	22	35	38	7.7	19	31	0.7	6.8	0.0	0.0	1.6	4
Glacier	93	93	53	55	9	7	19	35	35	8.0	11	16	1.0	6.4	4.0	4.5	1.6	1
Caldwell	78	85	52	57	6	3	19	33	33	8.3	22	6	1.2	3.1	0.0	1.0	0.8	21
Cardinal	85	87	53	57	9	5	21	35	35	8.1	22	37	12.6	13.9	3.8	7.5	4.3	4
Dynasty	90	88	54	56	8	5	22	32	33	8.3	5	13	33.2	54.7	0.0	0.0	5.3	37
Excel	88	85	53	54	9	6	24	30	30	8.4	0	2	28.3	23.7	0.0	0.0	4.3	28
Howell	92	89	57	58	8	5	21	35	35	8.3	1	13	20.1	37.9	0.8	1.0	1.9	18

Table 4. Milling and baking scores (M/B) for several soft red winter wheat varieties and Wisconsin selection X1625-1-1 (Glacier) in several Wisconsin tests during 1988-90 at Madison and Arlington, Wisconsin.

	Argee	Merrimac	Glacier	Caldwell	Cardinal	Dynasty	Excell	Howell
1988 Mad. RR	A/A	C/F	C/A	A/A	A/A	C/D	- -	C/F
1989 ARl. DP	- -	- -	C/D	A/A	- -	C/C	- -	C/F
1989 Mad. RR	- -	B/A	B/A	A/A	B/C	C/C	- -	C/F
1990 Mad. RR	A/B	B/C	A/A	A/E	A/E	B/D	B/D	A/F
1990 Mad. Trips	A/B	A/A	A/A	A/B	A/B	A/B	- -	- -

17

SEED SAMPLE OF GLACIER WHEAT

A seed sample consisting of at least 2,500 viable, untreated seeds is enclosed with this application.

FILING AND EXAMINATION FEE

A check in the amount of $2,150.00 covering the $250.00 filing fee and the $1,900.00 examination fee is enclosed with this application.

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EXHIBIT E: BASIS OF APPLICANTS OWNERSHIP

"This is to certify that I have been duly appointed as agent of the applicant. The applicant, The Wisconsin Agricultural Experiment Station, is the sole owner of "Glacier Wheat."

Robert A. Forsberg

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